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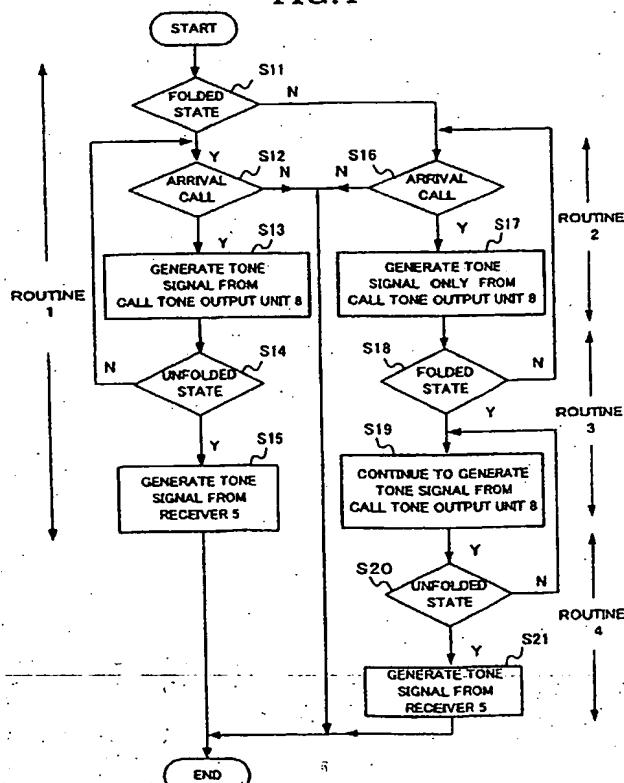
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(54) Abstract Title:

Foldable phone with configuration dependent notification of incoming call

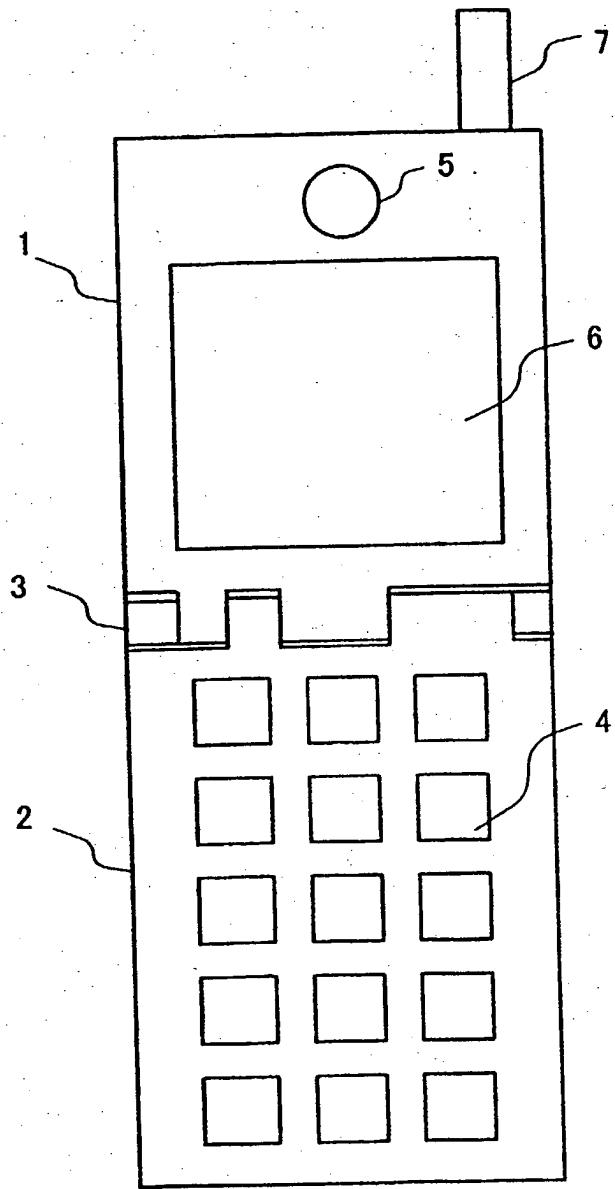
(57) A call tone output system for a foldable portable telephone set has a hinge to enable the set to be unfolded and folded. The call tone output system includes a detector 14 for detecting the unfolding and folding of the hinge, and a tone output control unit (11 and 20) for causing tone to be output from a call tone output unit 8, which outputs a call tone at the time of the arrival of a call, when a call arrives in the folded state of the hinge, and from a receiver, which outputs a reception tone, when the hinge is unfolded from the folded state.

FIG.4



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FIG.1



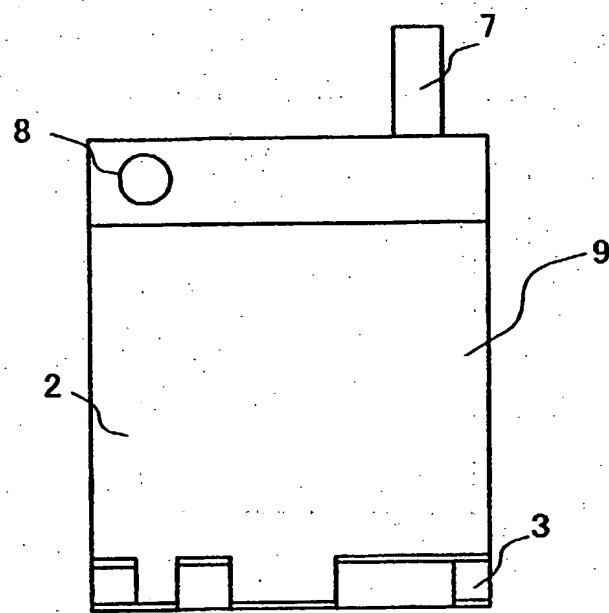
**FIG.2**

FIG.3

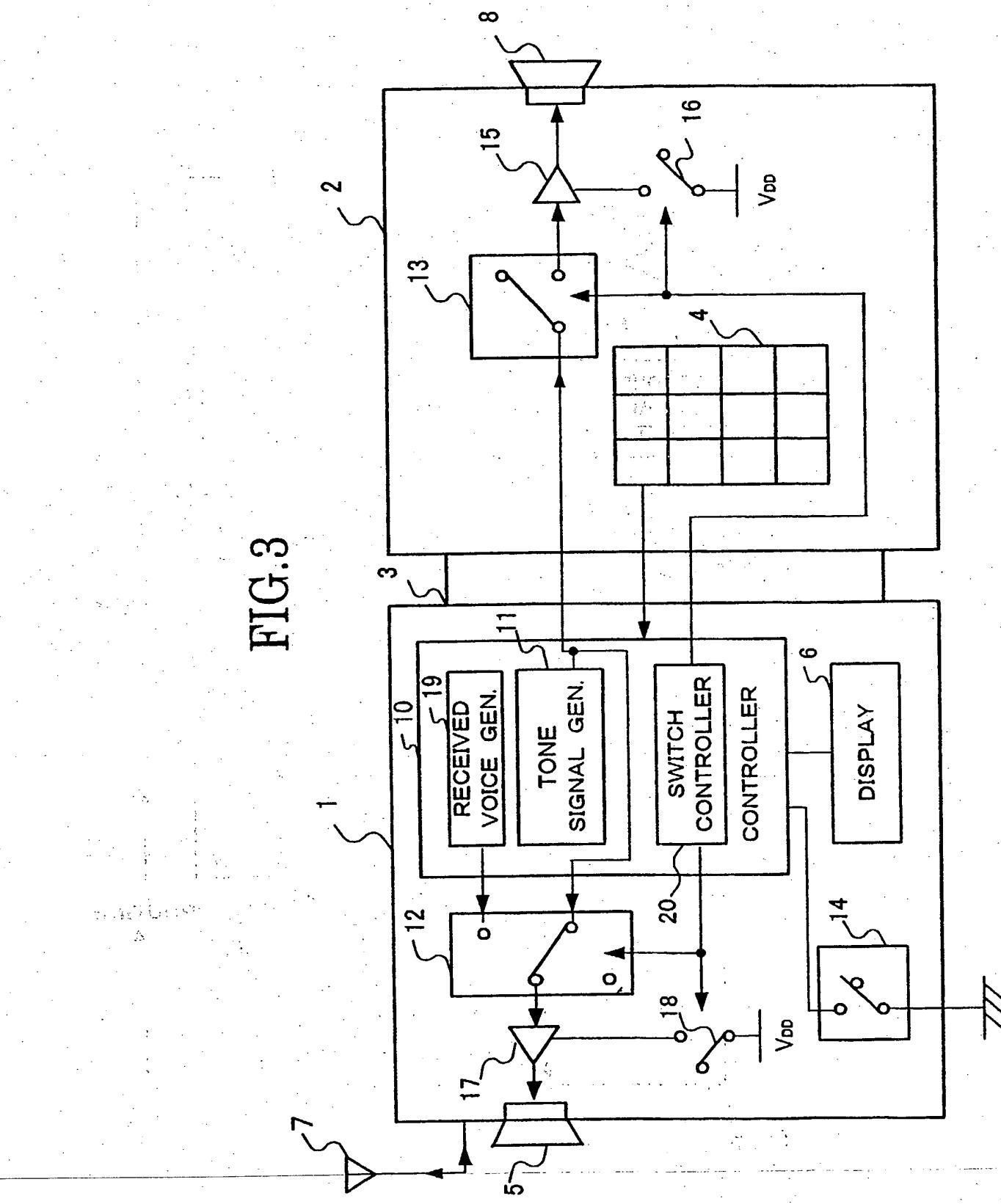


FIG.4

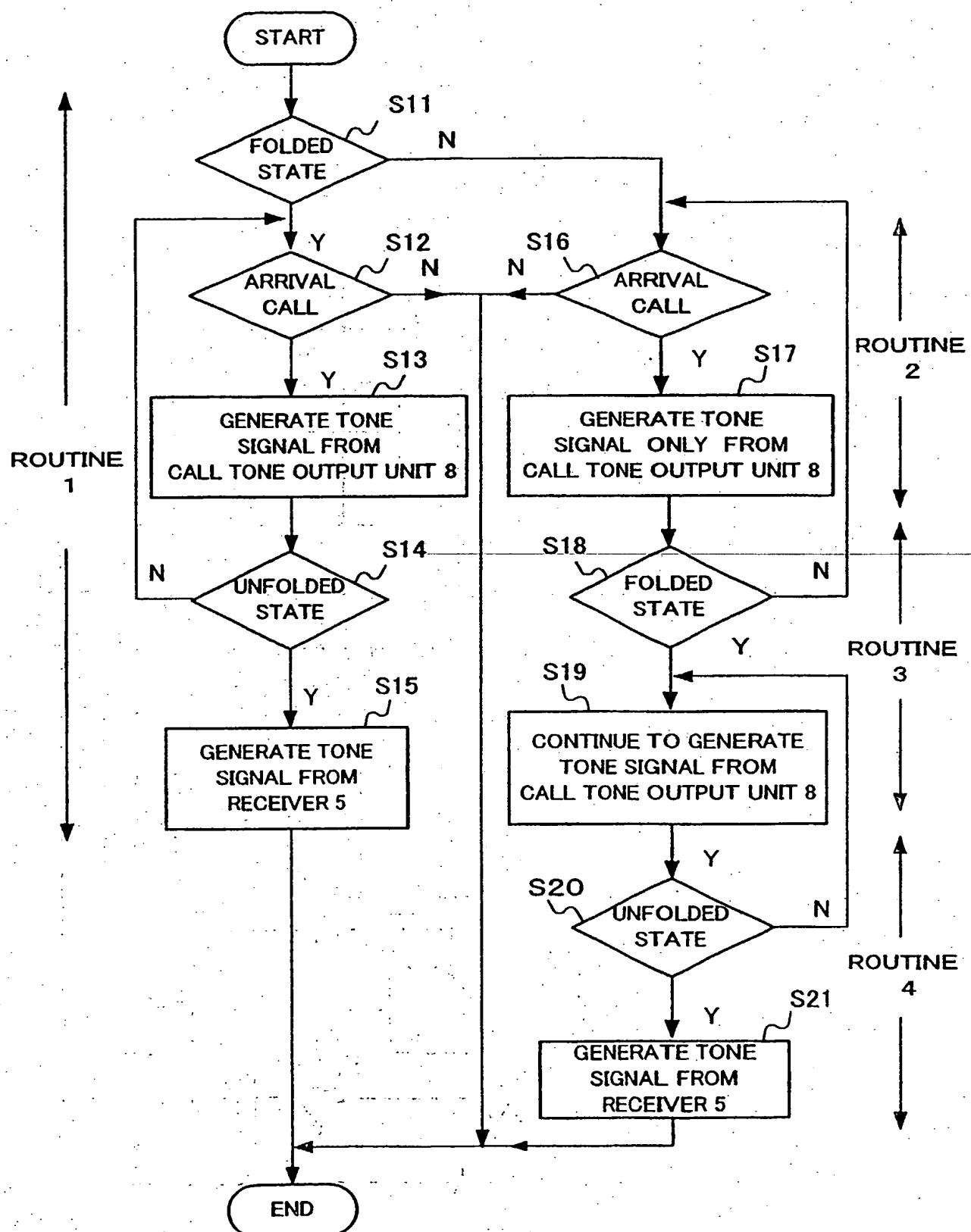


FIG.5

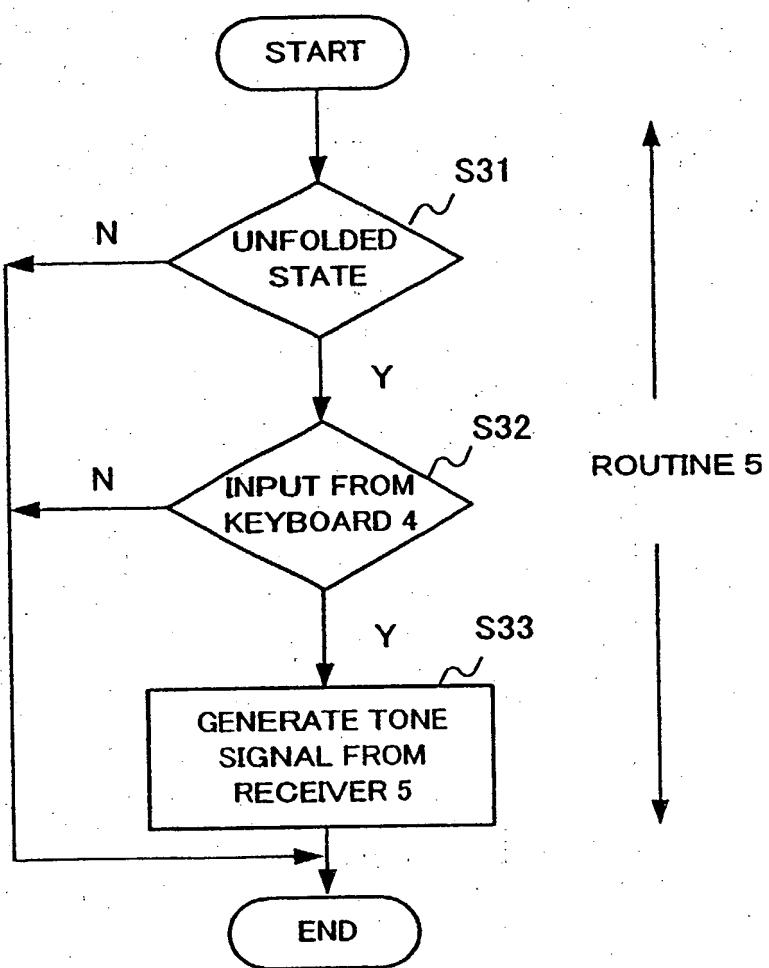
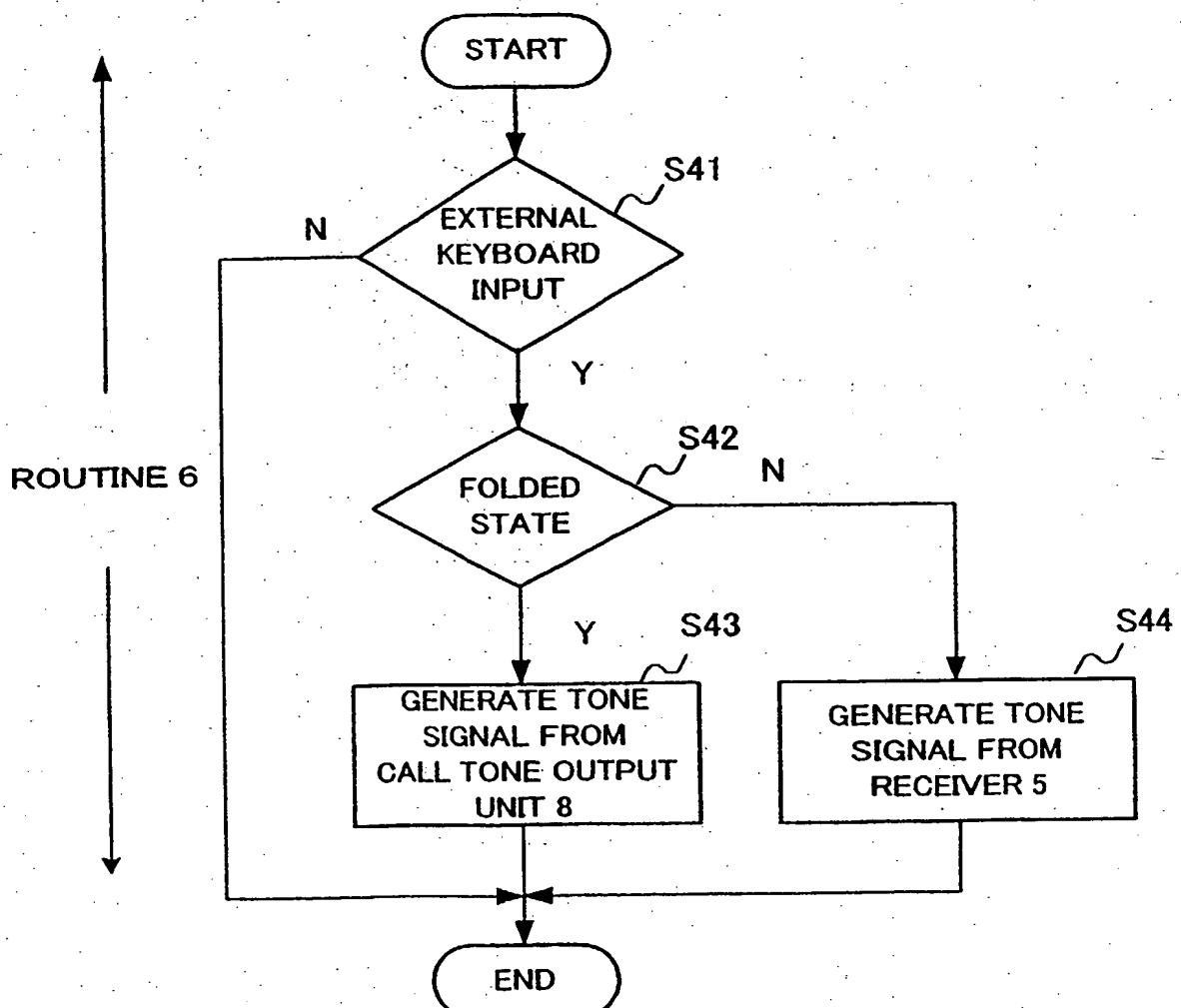


FIG.6



**FIG. 7**

**RELATION BETWEEN STATUS AT CALL ARRIVAL TIME  
AND TONE OUTPUT PART**

STATUS AT CALL ARRIVAL TIME	TONE OUTPUT PART	ROUTINE
FOLDED	CALL TONE OUTPUT UNIT 8 (RECEIVER 5 IS ARBITRARILY)	1
FOLDED → UNFOLDED	RECEIVER 5 (CALL TONE OUTPUT UNIT 8 IS ARBITRARILY)	
UNFOLDED	ONLY CALL TONE OUTPUT UNIT 8	2
UNFOLDED → FOLDED	CALL TONE OUTPUT UNIT 8 (RECEIVER 5 IS ARBITRARILY)	3
FOLDED → UNFOLDED	RECEIVER 5 (CALL TONE OUTPUT UNIT 8 IS ARBITRARILY)	4

**FIG.8**

**RELATION BETWEEN STATUS AT KEYBOARD INPUT  
AND TONE OUTPUT PART**

STATUS AT KEYBOARD INPUT	TONE OUTPUT PART	ROUTINE
UNFOLDED	RECEIVER 5 (CALL TONE OUTPUT UNIT 8 IS ARBITRARILY)	5
FOLDED	CALL TONE OUTPUT UNIT8 (RECEIVER 5 IS ARBITRARILY)	6
UNFOLDED	RECEIVER 5 (CALL TONE OUTPUT UNIT 8 IS ARBITRARILY)	

## FOLDABLE PORTABLE TELEPHONE SET AND METHOD OF OPERATION

The present invention relates to foldable portable telephone sets and their methods of operation. Systems for and methods of call tone output in foldable portable telephone sets, will be described below, by way of example in the belief that they will enable the invention to be better understood.

5 A foldable portable telephone set has a buzzer on its outer side in the folded state for outputting a call tone at the time of the arrival of a call.

Although buzzers have generally been used as call tone generators for portable telephone sets, recently they have been increasingly replaced by loudspeakers, as proposed in Japanese Patent Laid-Open No. 1-85454.

10 This trend is thought to be due to the unexpectedly great popularity of portable telephone sets, giving rise to the need for measures to be taken against noise from them reaching nearby people. More specifically, loudspeakers usually have narrower sound directivity than the directivity of sound from a buzzer, and it thus enables a call tone to be directed at the 15 time of the receipt of a call to the user, and not to nearby people.

A loudspeaker, however, has the problem that it is driven by a loudspeaker drive amplifier (with an input impedance of 4 to 8 ohms), which usually consumes more current than a buzzer (with an input impedance of about 32 ohms).

20 In addition, with the recent trend to reduce the size of portable

telephone sets, the loudspeakers which can be mounted on portable telephone sets usually have small output openings (mainly of 16 mm or below), and their sound pressure is usually low compared to buzzers.

Since there is also a trend to reduce the size, capacity and weight of power supply batteries, as noted above, it is extremely difficult to obtain a reduction in the current rating of the loudspeaker drive amplifier, while ensuring sufficient sound pressure.

Features of a system of and a method for obtaining a call tone output from a foldable portable telephone set capable of ensuring a desired sound pressure and a reduction of the current rating of the loudspeaker drive amplifier, using batteries which are small in size and are low in current rating will be described below, by way of example.

In a particular arrangement to be described, a hinged foldable portable telephone set which may be folded and unfolded about the hinge has a call tone output system which includes a detector for detecting the unfolding and folding of the hinge, and a tone output controller for controlling the tone output from a call tone output unit, which outputs a call tone upon the arrival of a call so that, when a call arrives in the folded state of the set, a tone is output from the receiver which is different from the tone which is output when the set is unfolded.

The unfolding of a foldable portable telephone set usually makes a display visible. Thus, a call tone that is output at the time of the arrival of a call, generally at relatively low sound level from the receiver, and provided on the same surface as the display, can be sufficiently well monitored. That

is, it is possible to reduce the loudspeaker drive amplifier power consumption by switching the loudspeaker in the call tone output unit power to a lower output power level loudspeaker in the receiver when the set is unfolded. It is thus possible to ensure a sufficient sound pressure, to reduce current in the loudspeaker drive amplifier, and to employ batteries which have a reduced size and current rating.

Preferably, the tone output controller causes a tone output to be provided only from the call tone output unit when a call arrives in the unfolded state of the hinged set.

10 In this case, it is possible to minimize damage to the ear at the time of arrival of a call, while the user is able to hear a voice from the receiver.

Preferably, the tone output controller continues to cause a tone output to be provided from the call tone output unit when the hinged set is folded from the unfolded state.

15 In this case, the operation is brought about by the user's intentional action, and a call tone output from only the call tone output unit is unnecessary. In addition, since the intentional action is usually assumed to be done with the display in a visible state, the relatively low level sound from the receiver can be sufficiently well recognized. That is, it is possible to

20 reduce the loudspeaker drive amplifier power consumption by switching the loudspeaker in the call tone output unit over to a relatively low output level loudspeaker in the receiver.

Preferably, the tone output controller causes the receiver to output an operation confirmation tone input from a keyboard in the unfolded state of

the hinged set. Further, the tone output controller is able to cause the output of the operation confirmation tone input from an external keyboard from the call tone output unit in the folded state of the hinged set, and from the receiver in the unfolded state of the hinged set.

- 5 In this case, the action of causing the confirmation tone output is done intentionally. Since this action is also usually done in the visible state of the display, the relatively low level sound from the receiver can be sufficiently well recognized. That is, it is possible to reduce the loudspeaker drive amplifier power consumption by switching the loudspeaker in the call tone output unit over to the loudspeaker in the receiver.

Preferably, the tone output controller causes the output from the receiver to occur at the time of the tone output from the call tone output unit. Further, the tone output controller causes tone output from the call tone output unit to occur at the time of the tone output from the receiver.

- 15 In this case, the sound pressure of the call tone can be increased. Furthermore, there will be described below a call tone output system for a foldable portable telephone set having a hinge enabling the set to be unfolded and folded which includes a receiver provided on the inner side of the foldable portable telephone set and having a loudspeaker for outputting a reception tone, a call tone output unit provided on the outer side of the foldable portable telephone set and having a loudspeaker for outputting a call tone at the time of arrival of a call, a tone signal generator for outputting a tone signal to the receiver and also to the call tone output unit, a detector for detecting the unfolding and folding of the hinged set, a receiver

- loudspeaker drive amplifier for driving the loudspeaker in the receiver, a call tone output unit loudspeaker drive amplifier for driving the loudspeaker in the call tone output unit, a receiver switch for turning on and off the output of the call tone signal from the tone signal generator to the receiver, a call tone output unit switch for turning on and off the output of the tone signal from the tone signal generator to the call tone output unit, a receiver power supply switch for connecting the receiver loudspeaker drive amplifier to a power supply therefor, a call tone output unit power supply switch for connecting the call tone output unit loudspeaker drive amplifier to a power supply therefor, and
- 10 a switch controller for controlling the receiver switch, the call tone output unit switch, the receiver power supply switch and the call tone output unit power supply switching and causing a tone to be output from the call tone output unit upon the arrival of a call in the folded state of the hinged set and from the receiver when the hinged set is unfolded from the folded state.
- 15 In this case, like the above case, it is possible to ensure sufficient sound pressure and to reduce the current in the loudspeaker drive amplifier while using batteries which are small in size and low in current rating.
- Still further, a call tone output method for a foldable portable telephone set having a hinge enabling the set to be unfolded and folded, and
- 20 to be described below, includes the step of detecting the unfolding and folding of the hinged set, and the step of causing a tone to be output from a call tone output unit, which outputs a call tone upon the arrival of a call, when a call arrives in the folded state of the hinged set, and from a receiver, which outputs a reception tone, when the hinged set is unfolded from the

folded state.

In this case, like the above case, it is possible to ensure sufficient sound pressure and to reduce the current in the loudspeaker drive amplifier while using batteries which are small in size and low in current rating.

- 5 A portable telephone set will furthermore be described below which has two member bodies capable of being unfolded and folded, and which includes a detector for detecting the unfolding and folding of the two member bodies, and a tone output controller for causing a tone to be output from a call tone output unit, which outputs a call tone upon the arrival of a call,
- 10 when a call arrives with the two member bodies in the folded state, and from a receiver, which outputs a reception tone, when the two member bodies are unfolded from the folded state.

The tone output controller causes a tone to be output only from the call tone output unit when a call arrives in the unfolded state of the two member bodies.

Arrangements which are helpful in enabling the invention to be better understood will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a schematic outer view showing a foldable portable telephone set, in an unfolded state,

Fig. 2 is a schematic outer view showing the foldable portable telephone set shown in Fig. 1 in a folded state,

Fig. 3 is a schematic circuit diagram showing a call tone generating system for the foldable portable telephone set,

Fig. 4 is a flow chart for describing various examples of the operating routine of a switch controller 20 in the controller 10 shown in Fig. 3,

Fig. 5 is a flow chart for use in describing Routine 5 of the switch controller 20 in the controller 10 shown in Fig. 3,

5 Fig. 6 is a flow chart for use in describing Routine 6 of the switch controller 20 in the controller 10 shown in Fig. 3,

Fig. 7 is a chart showing the correspondence between the status of the foldable portable telephone set and the tone output part of the set at the call arrival time, and

10 Fig. 8 is a chart showing the correspondence between the telephone set status and the tone output part of the set when an input is made from keyboard.

Referring to Figure 1, the illustrated foldable portable telephone set has box-like casings 1 and 2 mechanically coupled together by a hinge for 15 permitting its folding and unfolding.

The casing 2 has a keyboard 4 provided on its inner surface when the foldable portable telephone set is in the unfolded state. The keyboard 4 is used for inputting telephone numbers and also for the operations of various functions. The casing 1 has a receiver 5. The receiver 5 includes a 20 loudspeaker and outputs the other party's voice. The casing 1 also has a display 6. The display 6 is a liquid crystal device (LCD), and displays, the present status, messages, etc. The telephone set further has an antenna 7. The antenna 7 serves for the transmission and reception of signals to and from the base station. When the telephone set is in the folded state, the

keyboard 4 and the receiver 5 (and also the display 6) face one another.

Fig. 2 is a schematic outer view showing the foldable portable telephone set shown in Fig. 1 in a folded state.

As shown in the Figure, in the folded state of the foldable portable telephone set the keyboard 4, the receiver 5 and the display 6 are concealed, and cannot be directly seen from the outside. The casing 2 has a call tone output unit 8 provided on the outer surface in the folded state of the telephone set. The call tone output unit 8 includes a loudspeaker, and outputs a call tone at the time of arrival of a call. A tone output hole is provided such that it is directed towards the outer surface of the casing 2.

The output level of the loudspeaker of the call tone output unit 8 is set to be higher than the output level of the loudspeaker of the receiver 5 and the sound pressure and the current consumed by the call tone output unit 8 are also higher than those of the receiver 5. The foldable portable telephone set has a battery 9 which is concealed in the casing 2 in its folded state. The battery supplies power to various parts of the telephone set.

Fig. 3 is a schematic circuit diagram showing a call tone generating system in the foldable portable telephone set.

As shown in the Figure, the casing 1 of the foldable portable telephone set includes the call tone generating system, which has a controller 10. The controller 10 receives various control signals from the keyboard 4, and controls the telephone set, particularly the display on the display 6. The controller 10 includes a tone signal generator 11; a received voice generator 19 and a switch controller 20. The tone signal generator 11

generates a tone signal at the time of the arrival of a call. The received voice generator 19 generates the received voice from a received signal input from the antenna 7. The casing 1 has a switch 12. The switch 12 selectively passes either of the outputs of the generators 11 and 19 as an input signal to the receiver 5. A loudspeaker drive amplifier 17 is connected to the output side of the switch 12, and drives the loudspeaker as a sound generator in the receiver 5.

5 The casing 2 has a switch 13. The switch 13 controls the "on" and "off" condition of the output of the call tone generator 11 in the controller 10.

10 A loudspeaker drive amplifier 15 is connected to the switch 13, and drives the loudspeaker sound generator in the call tone output unit 8. The amplifiers 15 and 17 are connected via switches 16 and 18, respectively, to a power supply providing a voltage VDD.

The switch controller 20 in the controller 10 controls the switching of 15 the switches 12, 18, 13 and 16. A lead switch 14 is connected to the switch controller 20 in the controller 10. The lead switch 14 checks whether the casings 1 and 2 of the foldable portable telephone set are unfolded or folded 20 via the hinge 3, and provides a detection signal as a result of the check to the switch controller 20. The lead switch 14 is not limitative as a means for checking the state of unfolding and folding of the telephone set.

Figure 4 is a flow chart for use in describing various examples of operation routines of the switch controller 20 in the controller 10 shown in Fig. 3.

## (Routine 1)

Referring to the Figure, the switch controller 20 in the controller 10 executes a step S11 of checking, according to the detection signal from the lead switch 14, whether the foldable portable telephone set is folded or unfolded about the hinge 3. When the telephone set is in the folded state, the switch controller 20 executes a step S12 of checking whether there has been an arrival of a call. When it is determined that no call has arrived, the routine is brought to an end.

When it is determined that a call has arrived in the folded state of the foldable portable telephone set, the switch controller 20 turns on the switches 3 and 16, whereby the tone signal generator 11 causes there to be a tone output from the call tone output unit 8 (step S13).

More specifically, it may be detected that the lead switch 14 is "on" and also that the hinge 3 is in the folded state of the telephone set. The switch controller 20 recognizes the state of the set, and that the switch 13 is "on". At this time, the switch 16 is also "on" and carries a current. Thus, at arrival time of a call, a call tone is output from the call tone output unit 8, which is provided on the outer surface of the casing 2 in the folded state of the set, thus providing notification of the arrival of a call.

In this case, the output of a call tone from the receiver 5 is optional. More specifically, the switch controller 20 may switch the switch 12 to the side of the call tone generator 11 and turn on the switch 18. Alternatively, the switch controller 20 may turn off the switches 12 and 18. The call tone output from the receiver 5 is accompanied by an increased sound pressure

of the call tone at the time of arrival of the call. Although it is optional to cause an output of the call tone to be provided from the receiver 5 at the time of arrival of the call, preferably it is not done so for the sake of reducing the current consumption in the foldable portable telephone set.

- 5        While the call tone is output at the time of arrival of the call, the switch controller 20 executes a step S14 of checking, according to the detection signal from the lead switch 14, whether the hinge 3 is in the unfolded state of the telephone set. When the hinge 3 is in the folded state of the telephone set, the routine goes back to the step S12. When the hinge 10      3 is brought from the folded state to the unfolded state of the telephone set, the switch controller 20 executes a step S15 of switching the switch 12 to the side of the call tone generator 11 and turns on the switch 18, whereby the call tone generator 11 causes the call tone to be output from the receiver 5.
- 15      More specifically, when the hinge 3 is brought from the folded state to the unfolded state of the telephone set, that is, when the lead switch 14 is switched from the "on" state to the "off" state during the output of the call tone at the time of arrival of the call, the switch controller 20 recognizes this change in the state of the switch, and controls the bus of the switch 12 so 20      as to couple the output of the call tone generator 11 to the receiver 5. At the same time, the switch 18 is turned on to cause current to flow through the loudspeaker drive amplifier 17.

In this case, the output of the call tone from the call tone output unit 8 is optional. Namely, the switch controller 20 may turn on or off the switches

13 and 16. The output of the call tone from the output unit 8, however, is accompanied by an increased sound pressure of the call tone at the time of arrival of the call. Although it is optional continually to provide the call tone output from the output unit 8 at the time of arrival of the call, preferably this 5 option is not followed in order to reduce the current consumption of the foldable portable telephone set.

As shown above, Routine 1 has the effect that, since unfolding the foldable portable telephone set usually makes the display 6 visible, it permits a call tone to be output at the arrival time of the call, generally at a relatively 10 low sound level, from the receiver 5 and provided at the same surface as the display 6, to be at a sufficient level to enable it to be recognized. That is, it is possible to reduce the loudspeaker drive amplifier power consumption by switching the loudspeaker in the call tone output unit 8 over to the lower output level loudspeaker in the receiver 5. Further current reduction is 15 obtainable by turning off the power supply to the loudspeaker drive amplifier 15 (i.e., turning off the switch 16).

(Routine 2)

When the hinge 3 is in the unfolded state of the telephone set, the switch controller 20 executes a step S16 of checking whether a call has 20 been received. When no call has been received, the routine is brought to an end. When a call has been received with the telephone set in the unfolded state, the switch controller 20 executes a step S17 of turning on the switches 13 and 16, whereby the tone signal generator 11 causes a tone to be output from only the call tone output unit 8.

In this case, no tone is output from the receiver 5. More specifically, when a call has been received in the unfolded state of the hinge 3, the switch 20 recognizes that the lead switch 14 is "off", and thus turns off the switches 12 and 18 while turning on the switches 13 and 16, whereby the receiver 5 outputs no tone and only the call tone output unit 8 outputs a call tone.

As shown above, Routine 2 has the effect that it is possible to eliminate the possibility of damage being caused to the eardrum of the user at the time of arrival of a call, while the user is hearing the sound of a voice from the receiver 5. In other words, it is possible to provide a method of operation, in which the possibility of a product liability claim is minimised.

(Routine 3)

In this routine, while a tone is being output, the switch controller 20 executes a step S18 of checking whether the hinge 3 has been operated so that the set has been arranged in the folded from the unfolded state. When the hinge 3 remains with the set in the unfolded state, the routine goes back to the step S16. When the switch controller 20 detects that the hinge 3 has been operated so that the set is in the folded from the unfolded state, it executes a step S19 of causing the call tone output unit 8 to continue to provide the output of the tone. This is done in order to ensure that the sound pressure of the call tone is sufficient.

In this case, the output of the tone from the receiver 5 is optional. More specifically, upon the detection of the operation of the hinge 3 and the folding of the set, the lead switch 14 is turned "on" from the "off" state. At

this time, the switch states of the switches 12 and 18 become optional, although the states of the switches 13 and 16 remain unchanged from the states in Routine 2. The tone output from the receiver 5 is accompanied by an increased sound pressure of the call tone at the time of arrival of the call.

- 5 In order to reduce the current consumption in the foldable state of the portable telephone set, the switches are held in such a way as to prohibit the output of the call tone from the receiver 5.

(Routine 4)

- The switch controller 20 further executes a step S20 of checking
- 10 whether the hinge 3 has been operated so that the telephone set is in the unfolded from the folded state. When the hinge 3 is such that the set remains folded, the routine goes back to the step S19. When the hinge 3 is in the position reached when the set has been unfolded from the folded state, the switch controller 20 causes the output of the tone from the
  - 15 receiver 5. In this case, the output of the call tone from the call tone output unit 8 is optional. In routines 3 and 4, the action set out in Routine 2 is unnecessary at this time because the user has carried out an intentional action. The presumed intentional action by the user is usually assumed to be conducted with the display 6 in its visible state, and the same effects as
  - 20 are set out in the description of Routine 1 are obtainable.

(Routine 5)

Reference is made to Fig. 5, which is a flow chart for use in describing Routine 5 concerning the operation of the switch controller 20 in the controller 10 shown in Fig. 3.

In this routine, the switch controller 20 in the controller 10 executes a step S31 of checking, according to the detection signal from the lead switch 14, whether the position of the hinge 3 corresponds to the set in the unfolded or folded state. When the position of the hinge 3 corresponds to 5 the set in the folded state, the routine is brought to an end.

- When the position of the hinge 3 corresponds to the set in the unfolded state, the switch controller 20 executes a step S32 of checking whether an input has been made from the keyboard 4 (or any other external keyboard). When no input has been made, the routine is brought to an end.
- 10 When an input has been made from the keyboard 4 with the hinge 3 in the position corresponding to the set in the unfolded state, the switch controller 20 executes a step S33 of causing an output of the tone to be provided from the receiver 5.

In this case, the output of the call tone from the tone call output unit 8 is optional. More specifically, when the position of the hinge 3 corresponds to the set in the unfolded state, the controller 10 recognizes the input from the keyboard 4, and controls the switches 12 and 18 such as to cause a confirmation tone to be output from the receiver 5. As a result, the switches 13 and 16 are able to assume optional states. The output of the call tone 20 from the tone call output unit 8 is accompanied by an increased sound pressure of the call tone at the time of arrival of the call. In order to reduce the current consumption in the foldable portable telephone set, the switches 13 and 16 are preferably held "off" to prevent the output of the call tone from the tone call output unit 8 at the time of arrival of the call.

Routine 5 is carried out in the case in which the outputting of the confirmation tone is made intentionally. This action is also usually carried out in the visible state of the display 6. That is, Routine 1 has the same effects as are obtainable in Routine 1.

5           (Routine 6)

Reference is now made to the flow chart of Fig. 6 which is useful for describing Routine 6 concerning the switch controller 20 in the controller 10 shown in Fig. 3.

- In this routine, the switch controller 20 in the controller 10 carries out
- 10       a step S41 of checking whether an input has been made from the keyboard
4. When no input has been made, the routine is brought to an end. When an input has been made, the switch controller 20 carries out a step S42 of checking, according to the detection signal from the lead switch 14, whether the position of the hinge 3 corresponds to the set in the unfolded state.
- 15       When the position of the hinge 3 corresponds to the set in the folded state, the switch controller 20 executes a step S43 of causing the output of the call tone to be provided from the call tone output unit 8. At this time, the output of the call tone from the receiver 5 is optional for the same reason previously given. Afterwards, the routine is brought to an end.
- 20       When the position of the hinge 3 corresponds to the set in the unfolded state, the switch controller 20 causes the output of the tone to be provided from the receiver 5 in the step S44. At this time, the output of the call tone from the call tone output unit 8 is optional, for the same reason as has been described above. Afterwards, the routine is brought to an end.

More specifically, in the case in which an external keyboard is used, the switch controller 20 controls the switches 12, 18, 13 and 16 in such a way as to cause the output of a confirmation tone to be provided from the call tone output unit 8 when the hinge 3 is in the position which corresponds to 5 the telephone set in the folded state, and from the receiver 5 when the hinge 3 is in the unfolded state.

Referring to Fig. 7 there is shown the corresponding relationship between the status of the foldable portable telephone set and the tone output at the time of arrival of the call. As shown, the relations between the 10 telephone set status and the tone output at the arrival time of the call in Routines 1 and 4 are shown collectively in order to enable a better understanding.

Fig. 8 is a view showing the corresponding relation between the status of the telephone set and the tone output when an input is made from 15 a keyboard. As shown, the relationship between the status of the telephone set and the tone output at the time of arrival of the call in Routines 5 and 6 are shown collectively in order to enable a better understanding.

As has been described above, the call tone is output from the call tone output unit at the time of arrival of the call when the hinge is in the 20 position corresponding to the set in the folded state and a received tone is output from the receiver when the hinge is in the position corresponding to the set in the unfolded state, having been in the folded state. Since unfolding the foldable portable telephone set usually makes the display visible, it permits a call tone that is output at the time of arrival of the call,

generally at a relatively low sound level from the receiver, to be provided at the same surface as the display, to be sufficiently loud to be recognized.

That is, it is possible to reduce the loudspeaker drive amplifier power consumption by switching the loudspeaker in the call tone output unit over to

- 5 the lower output level loudspeaker in the receiver. It is thus possible to ensure a sufficient level of sound pressure and to reduce the current in the loudspeaker drive amplifier enabling the use to be made of batteries which are reduced in both size and current rating.

- It will be understood that, although particular arrangements which are  
10 useful in enabling the invention to be understood have been described, by way of example, variations and modifications thereof as well as other arrangements may be conceived within the scope of the appended claims.

CLAIMS

- 5        1. A call tone output system for a foldable portable telephone set including a detector for detecting the unfolding and folding of the telephone set, a receiver, a call tone output unit, and a tone output controller for controlling the output of a tone such that when a call arrives with the set in the folded state, a tone is output from the call tone output unit, and when a call arrives with the set in the unfolded state a reception tone is output from the receiver.
- 10      2. A call tone output system for a foldable portable telephone set having a hinge to enable the set to be unfolded and folded, including a detector for detecting the unfolding and folding of the hinge, and a tone output controller for causing a call tone to be output from a call tone output unit, when a call arrives with the hinge in the folded state, and a reception tone to be output from a receiver when the hinge is in the unfolded from the folded state, the tone output controller causing a tone to be output only from the call tone output unit when a call arrives with the hinge in the unfolded state.
- 15      3. A call tone output system for a foldable portable telephone set having a hinge to enable the set to be unfolded and folded, including a

detector for detecting the unfolding and folding of the hinge, and a tone output controller for causing the tone output from a call tone output unit, which outputs a call tone upon a call arrival, when a call arrives with the hinge in the folded state, and from a receiver, which outputs a reception

- 5      tone, when the hinge is unfolded from the folded state, the tone output controller causing a tone output only from the call tone output unit when a call arrives in the unfolded state of the hinge and continuing to cause the tone output from the call tone output unit when the hinge is folded from the unfolded state.

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4.     A call tone output system for a foldable portable telephone set having a hinge to enable the set to be unfolded and folded, including a detector for detecting the unfolding and folding of the hinge, and a tone output controller for causing a tone to be output from a call tone output unit, which outputs a call tone upon the arrival of a call, when the call arrives with the hinge in the folded state, and from a receiver, which outputs a reception tone, when the hinge is unfolded from the folded state, the tone output controller causing a tone output only from the call tone output unit when a call arrives with the hinge in the unfolded state, continuing to cause the tone output from the call tone output unit when the hinge is folded from the unfolded state, and causing a tone output from the receiver when the hinge is folded from the unfolded state.

5.     A call tone output system for a foldable portable telephone set

- having a hinge to enable the set to be unfolded and folded, including a detector for detecting the unfolding and folding of the hinge, and a tone output controller for causing the tone output from a call tone output unit, which outputs a call tone upon the arrival of a call, and from a receiver,
- 5 which outputs a reception tone when a call arrives in the folded state of the hinge, when the hinge is unfolded from the folded state, the tone output controller causing the receiver to output an operation confirmation tone input from a keyboard in the unfolded state of the hinge.
- 10 6. A call tone output system for a foldable portable telephone set having a hinge to enable the set to be unfolded and folded, including a detector for detecting the unfolding and folding of the hinge, and a tone output controller for causing a tone to be output from a call tone output unit, which outputs a call tone upon the arrival of a call when a call arrives with
- 15 the hinge in the folded state, and from a receiver, which outputs a reception tone, when the hinge is unfolded from the folded state, the tone output controller causing the output of an operation confirmation tone, which is input from an external keyboard, from the call tone output unit when the hinge is in the folded state, and from the receiver when the hinge is in the
- 20 unfolded state.

7. A call tone output system for a foldable portable telephone set as claimed in any one of claims 1, 3 and 6, wherein the tone output controller causes the output to be from the receiver at the time of the tone

8. A call tone output controller for a foldable portable telephone set as claimed in any one of claims 1 and 4 to 6, wherein the tone output controller causes tone output from the call tone output unit to be at the time of the tone output from the receiver.

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9. A call tone output system for a foldable portable telephone set having a hinge to enable the set to be unfolded and folded, including a receiver provided on the inner side of the foldable portable telephone set, a loudspeaker for outputting a reception tone, a call tone output unit provided on the outer side of the foldable portable telephone set, a loudspeaker for outputting a call tone at the time of the arrival of a call, a tone signal generator for outputting a tone signal to the receiver and to the call tone output unit, a detector for detecting the unfolding and folding of the hinge, a receiver loudspeaker drive amplifier for driving the loudspeaker in the receiver, a call tone output unit loudspeaker drive amplifier for driving the loudspeaker in the call tone output unit, a receiver switch for turning on and off the output of the tone signal from the tone signal generator to the receiver, a call tone output unit switch for turning on and off the output of the tone signal from the tone signal generator to the call tone output unit, a receiver power supply switch for connecting the receiver loudspeaker drive amplifier to a power supply therefor, a call tone output unit power supply switch for connecting the call tone output unit loudspeaker drive amplifier to a power supply therefor, and a switch controller for controlling the receiver switch, the call tone output unit switch, the receiver power supply switch and

the call tone output unit power supply switching and causing tone output from the call tone output unit upon the arrival of a call in the folded state of the hinge and from the receiver when the hinge is unfolded from the folded state.

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10. A call tone output method for a foldable portable telephone set having a hinge to enable the set to be unfolded and folded, including the steps of detecting the unfolding and folding of the hinge, and of causing a tone to be output from a call tone output unit, which outputs a call tone upon the arrival of a call, when a call arrives in the folded state of the hinge, and from a receiver, which outputs a reception tone, when the hinge is unfolded from the folded state.

11. A portable telephone set having two member bodies capable of being unfolded and folded, including a detector for detecting the unfolding and folding of the two member bodies, and a tone output controller for causing the tone to be output from a call tone output unit, which outputs a call tone upon the arrival of a call, when a call arrives in the folded state of the two member bodies, and from a receiver, which outputs a reception tone, when the two member bodies are unfolded from the folded state.

12. A portable telephone set as claimed in claim 11, wherein the tone output controller causes a tone to be output only from the call tone output unit when a call arrives in the unfolded state of the two member bodies.

13. A portable telephone set as claimed in any one of claims 1 to 6, 9, and 11 substantially as described herein with reference to the accompanying drawings.

5 14. A method of operating a foldable portable telephone set as claimed in claim 10 substantially as described herein with reference to the accompanying drawings.



Application No: GB 0106283.5  
Claims searched: 1-14.

Examiner: Bridie Collier  
Date of search: 5 December 2001

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): H4L (LECY, LEUF, LEUX, LESF, LERA)

Int Cl (Ed.7):

Other: Online: WPI, EPODOC, JAPIO

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2339648 A (NEC)	
A	GB 2328347 A (NEC)	
A	GB 2314188 A (NEC)	
X	GB 2277851 A (MOTOROLA) See Fig 6	1-6, 9,10,11
X	JP 2001211241 A (SANYO)	1-6, 9,10,11

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